

NC CSC Capacity Building Final Report

1. ADMINISTRATIVE: *Please include name and contact information of the award recipient, agency or institution, project title, agreement number, date of report, and period of time covered by the report.*

Title: Capacity Building in the North Central Climate Science Center Domain

Project period: September 2013 – December 31, 2014

Agreement Number: G13AC00393

Date of Report: December 17, 2014

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Collaborators: Bob Gough, Intertribal Council on Utility Policy; Dan Wildcat, Haskell University; Brian Miller, CSU Natural Resource Ecology Laboratory; Colin Piney, CSU Natural Resource Ecology Laboratory

2. PUBLIC SUMMARY: *The public summary should be concise and informative, and should be self-contained and intelligible to a layperson. In less than 300 words please describe your major scientific achievements to a non-scientific community (i.e., in non-scientific language) including major benefits of your research to society at large. Highlight the findings and significance of your research to expanding general knowledge in your scientific discipline, and the application of the results of your research to address significant societal problems. The CSC may use the public summary in publicly-distributed documents and other materials.*

In addition to the major projects funded by the North Central Climate Science Center (NC CSC), selected through its solicitation process or the directed funds going to the foundational Science Areas, there remains a need within the north central domain to support work that builds capacity among stakeholders that have been otherwise left out of the major projects funded by the NC CSC. During the course of the project, we focused on such stakeholder capacity building by providing regional offerings of climate-related courses for resource managers, supporting tribal college students and deploying technology to better understand how climate impacts living things, and supporting strategic scientific study of the climate/energy/environment nexus in the Missouri River Basin. First, the NC CSC provided climate education opportunities in collaboration with the U.S. Fish and Wildlife Service National Conservation Training Center (NCTC). We offered the NCTC Climate Change Vulnerability Assessment class to managers and students April 22-24, 2014 in Jackson, WY, and September 30 - October 2, 2014 in La Crosse, WI. Future courses will include Climate Smart Conservation. The NC CSC has also worked with the Indigenous Peoples Climate Change working group to establish an Indigenous Geography Phenology Network by providing support to tribal college students to collect

observations of plant and animal life-cycle stages (known as phenology) for culturally significant plants and animals, and uploading these observations to a citizen-science database ([USANPN](#)). In addition, the NC CSC has collaborated with the USGS AmericaView program to deploy cameras that will record phenology throughout the region. Finally, we supported the Intertribal Council On Utility Policy (ICOU) to formulate a strategic scientific study to understand and demonstrate how climate science can be integrated into resource management decisions, especially with regard to climate/energy/environment nexus in the Missouri River Basin.

3. PURPOSE AND OBJECTIVES: *Describe the project goals and objectives, with particular emphasis on changes made to the objectives as stated in the original proposal. If the objectives have been added to, eliminated, or modified, please explain why these changes have been made.*

In addition to the major projects funded by the North Central Climate Science Center (NC CSC), selected through its solicitation process or the directed funds going to the foundational Science Areas, there remains a need within the north central domain to support work that builds capacity among stakeholders that have been otherwise left out of the major projects funded by the NC CSC. The objective of this project was to focus on such stakeholder capacity building with two activities related to enhancing tribal capacity in understanding and adapting to climate variability, and a third activity to provide technical support for phenology cameras (or PhenoCams) at multiple locations within the NC CSC domain.

During the course of the project, we added the goal of providing climate education opportunities. We made this change in order to capitalize on an opportunity to improve outreach and capacity building by leveraging training that was already being implemented by the U.S. Fish and Wildlife Service National Conservation Training Center (NCTC).

4. ORGANIZATION AND APPROACH: *Explain how each research task is being conducted. Briefly list which research methods are being used to achieve results, including new methods that were not described in the original proposal. Please also discuss any problems or delays encountered in conducting the research during the reporting period.*

Capacity building efforts are organized into three major types of activities: tribal capacity building, PhenoCams and wildlife migration, and training.

Tribal Capacity Building: The concept behind the indigenous phenology capacity building work is to offer tribal college and university mini-grants to develop student phenological and meteorological observation projects in order to document the impacts of climate change and contribute to the student activities within the larger national effort of Indigenous Peoples Climate Change Working Group. This tribal-college phenology approach is meant to compliment the Smithsonian National Museum of the American Indian to develop “Indigenous Geography” curricula. This activity will also enhance collaboration within the NC CSC domain as well as with other CSCs, the USA National Phenology Network (USANPN), and USGS Status and Trends Program. In this way, tribal observations will be building the capacity for a locally grounded, nationally connected observation network. Work in the past year has laid the foundation for persistence and expansion of these efforts. Collaborator Dr. Dan Wildcat (Haskell Indian Nations University) is overseeing the implementation of this activity.

We also provided support for the Intertribal Council On Utility Policy (ICOUP) to formulate a strategic scientific study to understand and demonstrate how climate science can be integrated into resource management decisions, especially with regard to climate/energy/environment nexus in the Missouri River Basin

PhenoCams and Wildlife Migration: In conjunction with AmericaView StateView partners and the National PhenoCam Network, the NC CSC is supporting the deployment of PhenoCams in Colorado, Kansas, Montana, Nebraska, North and South Dakota with an additional camera deployed in Wyoming in collaboration with the WLCI.

We are collaborating with Matthew Kauffman (Leader, Wyoming Cooperative Fish & Wildlife Research Unit, USGS and University of Wyoming (UW)) to provide climate data support for a study testing the “green-wave” hypothesis that Wyoming Range mule deer maximize their individual fitness by closely tracking plant green-up as they migrate from winter to summer range. This work is part of the Wyoming Migration Initiative and is partially supported by the Wyoming Landscape Conservation Initiative (WLCI).

Training: We are providing climate education opportunities through cooperation with the National Conservation Training Center (NCTC).

5. RESULTS: *Present your preliminary project results if possible. Both quantitative and qualitative results (descriptions of how well or poorly something worked) are useful. Of particular interest are major discoveries, innovative approaches and solutions, and accomplishments made by the project team to date.*

Tribal Capacity Building: NC CSC USGS Director Morisette and LoriAnne Barnett (USANPN) traveled to Haskell Indian Nations University on February 25, 2014 to provide a seminar on the USA NPN and communicate and coordinate with the University faculty and students, and initiate the indigenous phenology project. Since their visit, Wildcat and his students have undertaken data collection to establish the concept for further collection efforts. Students have begun making observations of culturally and traditionally significant plants to generate data sets for use in climate change impact assessments. In particular, students have thus far uploaded over 100 observations for the Wakarusa Wetlands Indigenous Trail to Nature’s Notebook (data can be downloaded from [USANPN](#)). Wildcat presented a poster on this work at the Rising Voices of Indigenous People in Weather and Climate Science Workshop ([Boulder, CO, June 30 - July 1, 2014](#)). Based on this poster, Barnett created a page for the [Indigenous Geography Phenology Network](#) that is hosted on the USANPN website. Cody Gibson (student at Haskell) also presented on this work at the Indigenous Peoples Climate Change Working Group meeting (Washington, D.C., November 3-4, 2014). Future work will include providing cell phones to students so they can directly upload phenological observations to Nature’s Notebook in real-time, and tracking the establishment of additional phenological observation sites.

ICOPU held a workshop (July 15-16, Boulder CO) with a number of invited federal partners (including WAPA and NREL in DOE, COE in DOD, BOR and LCCs in DOI, NOAA and NIDIS in DOC, NASA and EPA), tribal and private (UCAR/NCAR and associated universities) to formulate a strategic scientific study to understand and demonstrate how climate science can be integrated into resource management decisions, especially with regard to

climate/energy/environment nexus in the Missouri River Basin. In particular, ICOUP proposed a study of year climate and weather variability with regard to the management of the Missouri River's water resources and potential impacts on habitat conservation, dam releases and stream flow management, soil moisture monitoring, cultural preservation, wind-hydro energy development, and carbon sequestration and emissions reduction, as well as the agricultural and land management sectors of the regional economy. The culture, society, economy and ecology of North Central area critically depend upon atmospheric, surface and ground water resources. Water is the underlying basis energizing this agriculturally dominated region, for irrigation, transportation and electricity. This region straddles both a drought and flood prone area, and this larger study could provide a model high-resolution, prospective, basin-wide climatic assessment of the wind and precipitation regimes for the next three decades.

PhenoCams: The Wyoming and South Dakota cameras are on-line with the majority expected to be fully operational to capture the start of the 2015 growing season. Discussions are underway to work with students for preliminary data analyses in conjunction with the National PhenoCam Network, the USANPN and remote sensing data products. Kevin Dobbs presented an overview of the AmericaView Phenocam deployment at the NC CSC monthly check-in on November 18, 2014.

We kicked off our effort with a workshop at the Resource for Advanced Modeling (RAM) on January 27, 2014, which led to an additional collaboration with NASA to use the migration study area to test a daily MODIS NDVI product. During the 2014 growing season, the WLCI phenology team provided plant identification and sampling assistance to the project. Geneva Chong will be presenting preliminary analyses (by UW graduate student Ellen Aikens) of how well Wyoming Range mule deer movements fit the green-wave hypothesis at the Jackson Hole Wildlife Symposium December 4, 2014.

Training: We offered the NCTC Climate Change Vulnerability Assessment class to managers and students in the Greater Yellowstone Area and across the country April 22-24, 2014 in Jackson, WY. Morisette and Dr. Brian Miller worked as an instructor and an instructor-in-training, respectively, for this course. They both served as instructors for another regional offering of the course September 30 - October 2, 2014 in La Crosse, WI. Morisette also participated as an instructor-in-training for NCTC's Climate Smarts Conservation, offered on September 9-11, 2014, Fort Collins.

6. NEXT STEPS: *State and describe the next steps in the research, including an updated project timeline and anticipated completion date.*

Tribal Capacity Building: Work in 2015 will include continued observations at the Haskell Indian Nations Universities and the exploration of expanding observations to one to three more tribal colleges.

PhenoCams: In 2015 Miller will take over as project manager, with science support from Chong and continued collaboration with the AmericaView partners. The efforts in 2015 will focus on analyzing the utility of the phenocam data, in conjunction with Landsat observation, to assess the uncertainty in the 250m MODIS land surface phenology data. This uncertainty analysis will feed

directly into the goal of the NC CSC Ecological Impacts Foundational Science Area to: Statistically relate grassland phenology to climate, soils, and landform and project potential changes in grassland phenology under IPCC climate scenarios.

In January 2014 we hosted Kauffman, Dr. Kevin Montieth and Matt Hayes (data management) at the Resource for Advanced Modeling (RAM) at the USGS Fort Collins Science Center. We initiated an analysis of NDVI to use in an investigation regarding the Wyoming Range Mule Deer herd migration and their ability to track the “green wave” to maximize individual fitness (measured as body condition and reproductive success). NC CSC USGS Director Morisette is facilitating collaboration with NASA to test a daily MODIS NDVI product in this region of western Wyoming. A graduate student is partially funded through collaboration with USGS researcher Chong and her involvement with the Wyoming Landscape Conservation Initiative. That effort is supporting vegetation sampling on the ground and additional discussions regarding the green wave hypothesis and climate change impacts on the benefits of migration. Graduate student Aikens’ work is being presented by Chong at the Jackson Hole Wildlife Symposium December 4, 2014, with highlights on patterns of green-up, timing of animal use and potential impacts of climate change on both.

Training: Future work in 2015 will include exploring ways to provide follow-up opportunities for past students – such as with additional face-to-face and online training options, contact with other practitioners, and guidance regarding the various climate-related training opportunities offered by NCTC. The focus of this effort will be the students from the La Crosse Training as the NC CSC and NCTC plan to conduct the Climate-Smart Conservation Training in La Crosse, WI, in the fall of 2015.

7. OUTREACH: *Describe all project-related outreach opportunities to date. Include a list of articles that are in preparation, under review, accepted, or published in peer reviewed journals and other non-peer reviewed journals. Also list project-related conference presentations, seminars, webinars, workshops, or other presentations to the public made by research team members. Please also report on any communications with decision-makers, including their name and agency and the date(s) and frequency of your communications. Information on whether the decision-makers were involved in the design of the project plan or if the research has been tailored to address a specifically-stated management need is also helpful.*

Presentations at Professional Meetings:

- Aikens, E; Chong, G; Kauffman, M; Montieth, K; Dwinnell, S; Hayes, M; and Fralick, G. Are Wyoming Range mule deer catching the green wave? Jackson Hole Wildlife Symposium (December 4, 2014).
- Gibson, C. Indigenous Geography Phenology Network, presentation at the Indigenous Peoples Climate Change Working Group meeting, Washington, D.C. (November 3-4, 2014).
- Wildcat, D. Indigenous Geography Phenology Network, poster at Rising Voices II Boulder CO (June 30 - July 1, 2014).
- Gough, Bob. Wind Power from Tribal Lands (given uncertainties in hydro power). Presentation at 8th International Congress for Wildlife and Livelihoods on Private and Communal Lands, Estes Park, CO. September 2014

Webinars:

- Dobbs, K. AmericaView: deployment of phenocams and research plans, NC CSC Monthly Check-In (November 18, 2014).
- Chong, G. NC CSC Phenology Observations Network: Phenocams, Phenotrail, Migration and Remote Sensing, NC CSC Monthly Check-In (December 16, 2014).

Teaching and Workshops:

- Chong, Miller, and Morisette organized and taught a regional offering of NCTC CCVA Course in Jackson, WY (April 22-24, 2014).
- Miller and Morisette taught a regional offering of the NCTC CCVA course in La Crosse, WI (September 30-October 2, 2014).

8. BUDGET: *Briefly describe the budget, with particular emphasis on changes to the budget that was submitted in the original proposal. Please discuss reasons for substantial budget modifications or why funds have not been spent as expected.*

Funds were originally allocated to tribal capacity building projects aimed at increasing understanding and adaptation to climate variability, and technical support for PhenoCam deployment. The funds allocated for the workshop on energy options for tribal lands organized by Intertribal Council on Utility Policy were used for this effort. There were no changes from the originally allocated budgets.